REMARKS

By this Response, no claims were added, withdrawn, or amended. As a result, Claims 1-38 are pending and in the case.

In the Office Action, the Examiner allowed Claims 23-38, objected to Claims 2-6 and 13-17 as being dependent upon a rejected base claim, and rejected Claims 1, 7-11, 12 and 18-22 under Section 103 as being obvious over Gelbart (U.S. 6,147,789). With respect to Gelbart, the Examiner believes Gelbart (Figures 1a and 1b) discloses a mirror as a light modulator that can be displaced and deformed. The Examiner also noted that while Gelbart does not specifically reference a hinge means, he believes element 1 [single ribbon] of the Gelbart drawings is "a means that is the equivalent to the hinge structure of the [Applicants'] invention and would be used by one skilled in the art depending on what restoring force is [needed] for the device." The Examiner further opines that "the type [of] biasing and use of electrostatic actuators to curve the mirror into a certain shape are design choices that one skilled in the art would use depending on the specific function of the mirror."

Applicants respectfully disagree with the Examiner's assessment of the prior art and its application to their development. Applicants' patent application is to a mirror and to a light modulator as defined in Claims 1 and 12. One embodiment is shown in Figures 8 and 9 and a second embodiment is shown in Figures 10a and 10b. Both embodiments are premised upon the same principles. Claim 1 calls for a flexible light-receiving member and a hinge "adapted to extend below said light-receiving member and being displaceable between deformed and extended positions thereby allowing for at least one of the displacement and the deformation of said light-receiving member" and Claim 12 calls for at least one hinge extending between the substrate and the flexible mirror with the hinge "displaceable for allowing for at least one of the displacement and the deformation of said mirror."

As shown in Figure 8, a pair of hinges 100 supports a light receiving member (flexible mirror) 102 above a substrate 104 and an electrode 106 deposited on the substrate 104. Each hinge 100 includes a lower horizontal arm 110 and an upper arm 112. The application of a potential between the light receiving member 102 and the electrode 106 causes, in general terms, either a displacement of the light receiving member 102 towards the substrate 104, or its deformation, or both of these. This is depicted in Figure 9. This complex behavior of the light receiving member 102 is due to its own mechanical flexibility and to the mechanical flexibility

of the hinges 100 allowing their displacement between deformed and extended positions, as expressed by the pivoting movement and downward deformation of the upper arms 112 of the hinges 100. When the upper arms 112 of the hinges 100 are deformed downward, the angle α increases (from α (Fig. 8) to α' (Fig. 9)) and the peripheral edges 114 of the light receiving member 102 move closer to each other, thus reducing the mechanical tension in the light receiving member 102. To obtain this level of freedom in the movement and deformation of the light receiving member 102, one must properly design the hinges 100 so as to control their material properties - both electrical and mechanical - as well as their shape and dimensions. Thus, by controlling the above parameters, one can precisely predict and exploit the light receiving member (e.g., mirror) and the light modulator of the present invention.

These features of the hinges, mirror and modulator are absent in U.S. 6,147,789 to Gelbart, which was cited in Applicants' specification. Gelbart's Figures 1a and 1b show a mirror for light modulators and a light modulator comprising a mirror, consisting of the single ribbon 1 having a metal coating 2 suspended above a silicon substrate 4 by a layer frame 3. (Gelbart col. 2, lns. 43-58). Based on Gelbart's description, it is evident that the -layer frame 3 consists uniquely of a single part which lacks the flexibility allowing it to be displaceable between deformed and extended positions via a movement and deformation. As such, it does not permit a displacement, but only a deformation of the ribbon 1. Gelbart clearly states at col. 2, lns. 55-56 that application of a potential may only deform the light receiving member 1. This generally reduces the efficiency of the mirror and the modulator, as well as increases a demand for higher operating potentials (voltages). Thus, the particular characteristics of Applicants' hinges made possible by the hinges' particular architecture and choice of material lead to a particular behavior of the light receiving member resulting in a unique architecture of the mirror and the modulator with a significantly improved performance over the Gelbart disclosure.

Moreover, Gelbart states that the major disadvantage of the hinged or cantilevered mirror type is the slow response time. (Gelbart col. 1, lns. 36-40). This would naturally lead one to increase the stiffness of the structure in order to decrease the response time, with the disadvantage of increasing the activation voltage. This directs one away from Applicants' development which combines flexibility of the light receiving member 102 with the upper arms 112 of the hinges 100 permitting the reduction of the activation voltage while keeping a fast response time.

Finally, while use of the electrostatic potential to deform a micropart is well known in the art, a proper design of a structure capable of a complex mechanical behavior which can be controlled and used for light modulation requires a high level of ingenuity is not and cannot be considered obvious. Complex electromechanical behavior of the microparts, such as microbeams and microhinges, cannot be predicted intuitively; it can only be simulated using very advanced mathematical formulas and tools as taught, for example, in the following reference "Compliant Mechanisms, Design of Flexure Hinges" by N. Lobontin, CRC Press, New York 2003. As a result, it is totally improper for the Examiner to assume or allege what is common knowledge in the art, as he has done in the Office Action, without proper support. Accordingly, Applicants' development, as originally claimed, patentably distinguishes over the Gelbart references either alone or in combination with the alleged skill in the art.

CONCLUSION

In view of the above, all pending claims are firmly believed to be in condition for allowance; an action to this end is earnestly requested. If it would expedite the progress of this Application through the examination process, the Examiner is authorized to call the undersigned attorney.

The Examiner and Commissioner are hereby authorized to charge any fees or additional fees associated with this Response to our deposit account, Deposit Account No. 23-0280.

Respectfully submitted,

Date: 27 DECEMBER 2005 By: _____

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CERTIFICATE OF MAILING (37 C.F.R. § 1.8a)
I hereby certify that this correspondence is, on the date shown below, being deposited with the United States Postal Service with first class postage prepaid, in an envelope addressed to: Mail Stop Amendment, Commissioner For Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450 on 27 December 2005.

Kathleen Rundquist

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